# Azadirachta indica

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# *Azadirachta indica* A. Juss.

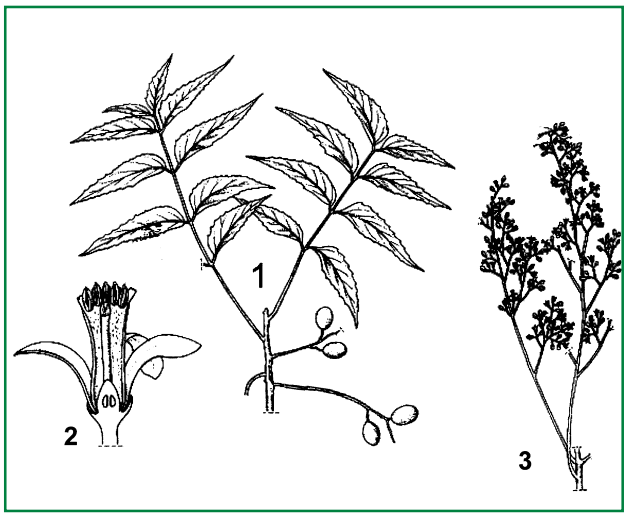
## Taxonomy and nomenclature

**Synonyms:** *Antelaea azadirachta* (L.) Adelb., *Azedarach fraxinifolia* Moench, *Melia azadirachta* L., *M. fraxinifolia* Adelb., *M. indica* (A. Juss.) Brandis, *M. pinnata* Stokes

**Vernacular/common names:** neem, neem-tree, Indian lilac, white cedar (Eng.); margosa tree (Port.); nim (Urdu); indischer zedrac (Ger.); azad-darakht-i-hindi (Persian); tamaka, bowtamaka, tama, (Burmese); sadao india, sadao thai (Thai).

## Distribution and habitat

Natural distribution is obscured by cultivation and naturalisation but it is believed to be native to Burma and NE India. Cultivated and spread into most semi-arid areas of India and Burma. Its status in Cambodia, Laos and Iran is not clear. Introduced into cultivation in many semi-arid and sub-humid areas of Asia and Africa, plus more recently into Australia, Latin America and southern United States. Wide temperature and rainfall regime. Most competitive in seasonal climate with long dry season and annual rainfall of 450-1150 mm. Most common at 0-700 m altitude but can grow up to 1500 m provided the temperature remains moderate. It does not tolerate cold or frost. Can grow on a wide range of soil types, but not tolerant to saline, waterlogged or cracking clay soils.




1, Fruiting branch; 2, section through flower; 3, part of inflorescence. From: Plant Resources of South-East Asia No.5:2.

## Uses

Fodder, oil, soap, shade, soil conservation, ornamental, insecticide.

## Botanical description

Medium sized tree, up to 15 m tall, rarely 25 m, with short, straight bole and long spreading branches, forming a dense, large, oval or rounded crown. Evergreen or, under extreme heat and drought, deciduous. Old bark turning dark grey, thick and furrowed. Leaves imparipinately compound with 7-17 pairs of leaflets, which are ovate or lanceolate, falcate with uneven base and dentate margins, 6-8 cm long, 1-3 cm wide. Inflorescence a 10-30 cm long panicle with many, small white to cream coloured flowers.

Neem is sometimes confused with the chinaberry, *Melia azedarach* L., but they are easily distinguished by the leaves. *Azadirachta* spp. have simple pinnate leaves, while those of *Melia* spp. are 2-to 3-pinnate.

## Fruit and seed description

**Fruit:** ellipsoid drupe, 1.2-2 cm long, green/yellow when ripe, with a thin hard cuticle and juicy fruit pulp. **Seed:** the pyrene contains one, rarely two, seeds. Seed weight varies with location and seed source. Available information indicates from 1700 seeds per kg in the Sahel to 3500-9000 seeds per kg in India.

## Flowering and fruiting habit

Flowers hermaphroditic or male. Pollination by insects. The tree starts flowering and fruiting at about 5 years of age. Flowering generally occurs in the dry season and fruit ripening during the early part of the rainy season. Season and duration of reproductive phenoperiods vary according to location and climate. In bi-modal climates there are sometimes two flowering and fruiting seasons.

In India flowering occurs 2-5 weeks earlier in the southern than in the northern part of the country, with an approx. delay of reproductive season of 4.5 days for each 1° increase in latitude between 20° and 30° N. Duration of period from flowering to mature seeds is 10-12 weeks. Individual fruits have a development and ripening period of 1-2 months.

## Harvest

The fruits are best collected from the tree since fallen fruits tend to have low viability. The optimum period for collection is when the colour of the fruit turns from green to yellowish-green. The easiest way of collection is to spread a tarpaulin under the trees and collect the fruits after they have been manually stripped of the branches or shed by shaking or beating the branches. At about 10-12 years of age a medium-sized tree may yield 35-55 kg of fresh fruits per year or some 25 kg of dry depulped fruits.

## Processing and handling

The fruit pulp must be removed before storage, either by hand or in a depulper. Under-developed and small fruits are initially discarded. The fully developed fruits are sorted according to maturity (colour). Fully mature fruits are depulped immediately to avoid fermentation. Green fruits are allowed to after-ripen in the shade 2-3 days before depulping. Depulping of green fruits is possible and does not affect viability but is more labour intensive.

## Storage and viability

Neem seed has traditionally been considered recalcitrant, but there is great variation according to climate and provenance. Some African and Central American provenances (land races) have tolerated desiccation to a moisture content of 5-7% and consequent storage at 4°C up to 8 years with a 70% maintained viability. The provenances from Asia are often more recalcitrant. Confined storage is generally recommended. In this case the fruits are depulped, maintained at high moisture content (50%) by storage in moist sand or sawdust, and sown as soon as possible. Viability of moist seed typically ranges from 1-2 weeks to 2-3 months depending on storage conditions. The initial moisture content of the seed is about 40%.

## Dormancy and pretreatment

No dormancy except from possible chemical inhibitors in the pulp, which are removed during depulping. Pretreatment is not required for fresh seeds. Manual scarification of the endocarp may enhance germination for seeds dried down to low moisture content.

## Sowing and germination

The seeds are sown either in seedbed, in containers or directly in the field. In seedbeds, the seeds are sown in drills 15-25 cm apart with a spacing of the individual seeds of 2.5 cm. The seeds are pressed lightly into seedbed soil and covered with 1 cm sand or sandmixed soil. The seedlings are transplanted into a transplant bed or to containers when they are about 5 cm tall.

If sown in containers the seeds are sown one or two per container at a depth of about 1-1.5 cm. If both seeds germinate, one of the seedlings is transplanted. Direct sowing should be in properly prepared pits worked to min 15 cm depth and sowing depth as in containers. In drier zones the survival after direct sowing is often very low. Germination is epigeal and takes 1-2 weeks for fresh seeds.

## Selected readings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Ripe neem fruits. Photo: Lars Schmidt, DFSC.


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